

| Notice of Allowability | Application No. | Applicant(s) | |
|-------------------------------|------------------------|---------------------|--|
| | 09/773,211 | JOISHA ET AL. | |
| | Examiner Insun Kang | Art Unit 2193 | |

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. This communication is responsive to 10/17/2005.
2. The allowed claim(s) is/are 12-14 and 16-22 (renumbered as 1-10).
3. Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
 - a) All
 - b) Some*
 - c) None
 1. Certified copies of the priority documents have been received.
 2. Certified copies of the priority documents have been received in Application No. _____.
 3. Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

* Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

4. A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
5. CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
 - (a) including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
 - 1) hereto or 2) to Paper No./Mail Date _____.
 - (b) including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.

Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
6. DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. Notice of References Cited (PTO-892)
2. Notice of Draftperson's Patent Drawing Review (PTO-948)
3. Information Disclosure Statements (PTO-1449 or PTO/SB/08),
Paper No./Mail Date _____
4. Examiner's Comment Regarding Requirement for Deposit
of Biological Material
5. Notice of Informal Patent Application (PTO-152)
6. Interview Summary (PTO-413),
Paper No./Mail Date _____.
7. Examiner's Amendment/Comment
8. Examiner's Statement of Reasons for Allowance
9. Other _____.

EXAMINER'S AMENDMENT

1. An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

Authorization for this examiner's amendment was given in a telephone interview with Ms. Panchawagh-Jain (Reg. 43, 846), Mr. Schumann, and Mr. Joisha on 1/20/2006.

The application has been amended as follows:

12. (Currently Amended) The computer implemented method of claim 22, wherein inferring calculating, prior to run-time, [[a]] the array shape-tuple [[for]] of the result of the program expression by creating [[a]] the shape-tuple expression comprising the input shape-tuple for the of said each operand and the shape-tuple operator comprises the steps of:

determining a rank of the resulting shape-tuple; and,

promoting the input shape-tuple for the of said each operand to an appropriate rank.

13. (Currently Amended) The computer implemented method of claim 22, wherein

determining the rank of the resulting shape-tuple comprises the steps of:

 determining a rank of the input shape-tuple ~~for the of said each~~ operand;

 identifying an operator corresponding to [[the]] said each operand; and

 determining the rank of the shape-tuple [[for]] of the result of the program

expression according to the operator and the rank of the input shape-tuple ~~for the of~~
said each operand.

14. (Currently Amended) The computer-implemented method of claim 12, wherein
promoting the input shape-tuple ~~for the of said each~~ operand to [[an]] the appropriate
rank comprises the steps of:

 comparing the rank of the shape-tuple [[for]] of the result of the program
expression to the rank of the input shape-tuple ~~for the of said each~~ operand;
 responsive to the rank of the shape-tuple [[for]] of the result of the program
expression being greater than the rank of the input shape-tuple ~~for the of said each~~
operand, expanding the input shape-tuple ~~for the of said each~~ operand to correspond
with the rank of the shape-tuple [[for]] of the result of the program expression; and,
 appending trailing extents of the expanded input shape-tuple ~~for the of said each~~
operand with an appropriate value.

16. (Currently Amended) The computer-implemented method of claim 22, wherein
the step of mapping the program operator to [[an]] the associated shape-tuple operator
comprises:

looking up, in a table, the shape-tuple operator corresponding to the program operator.

17. (Currently Amended) The computer-implemented method of claim 22, further comprising the step of calculating a shape predicate for the shape-tuple [[for]] of the result of the program expression.

18. (Currently Amended) The computer-implemented method of claim 22, further comprising the steps of:

 performing an array conformability check at run-time for a first program expression; and

 applying a result of the array conformability check to a second program expression.

20. (Currently Amended) The computer-implemented method of claim 22, further comprising the step of:

 preallocating storage for said each operand whose size is statically unknown, based upon the input shape-tuple [[for]] of said each operand in a loop.

21. (Currently Amended) The computer-implemented method of claim 14, further comprising:

responsive to the rank of the shape-tuple [[for]] of the result of the program expression being less than the rank of the input shape-tuple for the of said each operand, truncating the input shape-tuple for the of said each operand corresponding with the rank of the shape-tuple [[for]] of the result of the program expression.

22. (Currently amended) A computer-implemented method for inferring, prior to run-time, [[the]] an array shape of a result of a program expression of a high-level array-based language, ~~the program expression comprising an operand and a program operator,~~ the method comprising:

arranging an extent for each array dimension of [[the]] each operand of the program expression of the high-level array-based language when the size of at least one of said each operand is unknown into [[a]] an input shape-tuple for the of said each operand;

identifying [[the]] a program operator associated with [[the]] said each operand in the program expression;

mapping the program operator to an associated shape-tuple operator, wherein the shape-tuple operator is based upon the shape semantics of the program operator; and,

inferring calculating, prior to run-time, [[a]] an array shape-tuple [[for]] of the result of the program expression by creating a shape-tuple expression comprising the input shape-tuple for the of said each operand and the shape-tuple operator.

These amendments were necessary in order to further clarify the claims and obviate any rejection under 35 U.S.C. 112 2nd.

Examiner's Statement of Reason(s) for Allowance

2. Claims 12-14 and 16-22 (renumbered as 1-10) are allowed.
3. The following is an examiner's statement of reason s for allowance:

The closest prior arts of record, i.e. De Rose, taken alone or in combination, fail to teach or fairly suggest at least: arranging an extent for each array dimension of each operand of the program expression of the high-level array-based language when the size of at least one of said each operand is unknown into an input shape-tuple for the of said each operand... inferring, prior to run-time, an array shape-tuple of the result of the program expression by creating a shape-tuple expression comprising the input shape-tuple for the of said each operand and the shape-tuple operator as recited in the independent claim 22.

While De Rose discloses a static mechanism to determine the size of MATLAB variables, De Rose's static determination is to utilize explicit declarations of variable size. Ultimately, De Rose uses a dynamic method at run-time to infer variable size, when none is explicitly declared, using shadow variables. The present invention infers

the unknown size of variables prior to run-time by using a shape-tuple expression and a shape-tuple operator. See also Applicant's remark filed 3/7/2005.

*Note: The applicant stated that a new corrected abstract will be submitted on a separate sheet.

4. Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Insun Kang whose telephone number is 571-272-3724. The examiner can normally be reached on M-F 7:30-4 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kakali Chaki can be reached on 571-272-3719. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you

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have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

I. Kang
1/20/2006

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